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PROGRESS REPORT
FOR 1929 ON THE INTERRELATION OF FIRE AND INSECTS
IN YELLOW PINE
(Tubb's Hill Burn)

By
Henry J. Rust
Senior Scientific Aid

Forest Insect Field Station
Coeur d'Alene, Idaho

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INTRODUCTION

An exceptional opportunity to study the interrelation of fire and insects in yellow pine was made possible by the occurrence of a ground fire on the south slope of Tubb's Hill at Coeur d'Alene, Idaho. The fire, of incendiary origin, occurred on September 22, 1928, and burned over 30 acres of an almost pure yellow pine stand, before being placed under control. This burned area was examined by the writer during October and November, 1928, and all damaged trees six inches in diameter and over were marked with a metal tag and classified according to fire injury to the foliage and root collar. All barkbeetle damage found on the area was also recorded.

A 100 per cent survey of the Tubb's Hill burn was again made by the writer between the dates August 16 and September 10, 1929. The foliage conditions and all insect losses for the numbered trees were recorded for 1929. The metal tags had been taken from 37 of the trees but it was still possible to check these trees from the number that had been marked with indelible pencil on the small blaze. In summing up the results of the survey it was found that the mountain pine beetle infestation as reported in the preliminary report of the Tubb's Hill burn in July, 1929* had practically died out as only one small yellow pine was

* "Preliminary Report on the Interrelation of Fire and Insects in Yellow Pine, Tubb's Hill Burn, July 15, 1929."

found attacked by that species, and in this case was an associate attack with woodborers which had attacked the badly scorched side of the tree sometime previous.

The western pine beetle infestation was found to be increasing on the burn. In 1928 there were three yellow pine on the area that had been attacked prior to the fire. The survey for 1929 shows 20 yellow pine attacked, 6 by the first generation emerging in the spring, 13 by the second generation, and 1 by a partial third generation attacking in the early part of September. Seventy-one of the numbered trees 6 inches to 9 inches D.B.H., and 56 yellow pine under 6 inches D.B.H., not tagged nor recorded in 1928, had been attacked by Ips oregoni. Various species of woodboring larvae were present in many of the smaller trees, particularly those attacked early in the summer by Ips oregoni, and the few trees that had fallen from being burned through at the base, were heavily attacked by Buprestids and Cerambycids. Six badly scorched Douglas fir had been attacked by the Douglas fir beetle and two by woodborers.

A large per cent of the yellow pine that had been successfully attacked in 1928 by the mountain pine beetle was heavily attacked in 1929 by the ponderosa pine borer (Breates spinalatus). Sixteen dead adult beetles of this species were seen on the ground at the base of Tree No. 559. The larger yellow pine attacked by these woodborers soon blow down from the effects of the large larval mines cutting away the

heartwood at, or just below, the level of the ground. Very few of the fire-scorched needles have fallen from the injured trees since the examination made during the fall of 1925.

The vegetation on the burned area made a good recovery during the summer of 1929. From the charred remains of many of the larger shrubs that appeared to have been completely destroyed by the fire new shoots came up and, while but few bore flowers and fruit, they have a good start for the future. Among the smaller plants that reappeared over the entire burn might be mentioned, in order of their abundance, Spiraea corymbosa, spreading dogbane (Micromeria undulosaefolium), balsam-root, snowberry, wild lettuce (Lactuca spicata), fireweed, and horse weed (Eriogonum canadense).

CLASSIFICATION OF FIRE DAMAGE

The same classes of fire injury to the foliage and root collar as used in 1925 were continued for the 1929 survey. A comparison of the types of burn for 1925 and 1929 is as follows:

2. Types of Burn - 1925

1. No fire injury. All trees in Class I. No trees of this class were found within the boundary of the burn.
2. Light ground fire; practically no standing trees killed; damage represented by Classes II and III comprising 54.2 per cent of the stand.
3. Medium fire damage represented by Classes IV and V comprising 25 per cent of the stand.
4. Severe crown fire represented by Class VI comprising 17.8 per cent of the stand.

2. Types of Burn - 1929

1. No fire injury. All trees in Class I. No trees of this class were found within the boundary of the burn.
2. Light ground fire, practically no standing trees killed; damage represented by Classes II and III comprising 56.3 per cent of the stand.
3. Medium fire damage represented by Classes IV and V comprising 32.9 per cent of the stand.
4. Severe crown fire represented by Class VI comprising 10.6 per cent of the stand.

The difference in percentage between 1925 and 1929 in each type of burn is due to the recovery or loss of trees in each class. For example, trees that were thought to be beyond recovery and placed in Class VI in 1925 made some new foliage growth in 1929 and were placed in Class V. Other trees failing to make new growth were transferred to a class showing a higher degree of fire injury.

Acreage of Fire by Types of Burn

There is no change in total acreage, division of timber stand, and total volume board feet as given for 1925.

Estimated Volume in Board Feet According to Classes of Fire Injury

<u>1925</u>	<u>No.of Trees</u>	<u>Per Cent</u>	<u>Total Vol.Md.Ft.</u>	<u>Avg.Vol.Md.Ft.</u>	<u>Per Cent of Vol.</u>
Class I	0	0	0	0	0
Class II	397	37.8	53060	133	59.2
Class III	173	16.4	15150	86	17.0
Class IV	111	10.5	6390	57	7.0
Class V	185	17.5	9660	52	10.8
Class VI	157	17.5	5300	25	6.0
Total	1053	100.0	89560		100.0

Estimated Volume in Board Feet According to Classes of Fire Injury

<u>1929</u>	<u>No.of Trees</u>	<u>Per Cent</u>	<u>Total Vol.Md.Ft.</u>	<u>Avg.Vol.Md.Ft.</u>	<u>Per Cent of Vol.</u>
Class I	0	0	0	0	0
Class II	445	42.6	57440	128	64.1
Class III	144	13.71	6570	46	7.3
Class IV	112	10.6	4620	41	5.2
Class V	235	22.3	5330	23	6.0
Class VI	114	10.6	15600	137	17.4
Total	1053	100.0	89560		100.0

Comparison with 1925 Losses

	<u>No.of Trees</u>	<u>Per Cent</u>	<u>Total Vol.Md.Ft.</u>	<u>Avg.Vol.Md.Ft.</u>	<u>Per Cent of Vol.</u>
Class I	0	0	0	0	0
Class II	Gain of 51	Gain 4.8	Gain 4350	Loss 5	Gain 4.9
Class III	Loss 29	Loss 2.7	Loss 5530	Loss 40	Loss 9.7
Class IV	Gain 1	Gain 0.1	Loss 1770	Loss 16	Loss 1.5
Class V	Gain 50	Gain 4.5	Loss 4350	Loss 29	Loss 4.5
Class VI	Loss 73	Loss 7.0	Gain 10300	Gain 109	Gain 11.4

The 1929 survey shows a gain of 2.11 per cent in number of trees for Classes II and III; a gain of 4.9 per cent for Classes IV and V, and a loss of 7 per cent in Class VI. The gain in number of trees for each class can be accounted for by the recovery of trees in the subsequent classes. The loss in number of trees in Class VI being caused by the recovery and transfer to other classes of a number of the smaller yellow pine that were placed in this class in 1925. The gain in volume board feet in Class VI was caused by the transfer of some of the larger fire-injured yellow pine to this class in 1929.

INSECT LOSSES WITHIN THE BURNED AREA

In examining the burned area in 1928 it was found that a number of the larger fire-scorched yellow pine had been successfully attacked by the mountain pine beetle and, judging from the amount of brood present at that time, it was thought that this infestation might continue in the fire-weakened trees in subsequent years. The results of the 1929 survey showed that while there had been a normal emergence from 15 of the 1928 attacked trees, only one small fire-scorched yellow pine was found attacked by this species and in association with an attack by woodborers which had attacked the scorched side of the tree some time previous. No explanation can be offered at this time as to what became of the beetles that emerged from the trees attacked in 1928 other than the possible thought that as there were many small fires in the nearby hills during the summer the same attractions may have drawn them to some other freshly-burned area that brought them to the Tubb's Hill Burn.

The theory of the source of infestation by the mountain pine beetle in 1928, as stated in the preliminary report of the burn, i.e., that the attacking beetles came from stored beams of white pine logs, was somewhat strengthened by observations made this year. A large number of white pine logs was stored in the immediate vicinity of Tubb's Hill, as in 1928. An examination of these logs made September 19, 1929, showed a number of them containing heavy broods of Dendroctonus monticola on the top portion resting out of the water. The brood was estimated to be 15 per cent new adults, 35 per cent pupae, and 50 per cent larvae which were mostly in the

propagated stage. In the event of a continuation of the warm weather there may be more yellow pine on the burn attacked early in October by beetles emerging from the infested logs, unless they all attack nearby white pine logs as was the case with a few new adults emerging prior to the examination.

Yellow Pine Attacked by the Western Pine Beetle in 1929, Classified by Balingage Injury and Compared with Classification of Root Collar Injury

Tree No.	D. brevicornis Generation	Volume M.Ft.	Classification by Balingage Injury		Classification by Root Collar Injury	
			Class	Injury	Class	Injury
64	2	220		Class IV		Class IV
71	2	360	"	V	"	IV
106	2	610	"	II	"	V
160	2	--	"	III	"	IV
207	3	80	"	III	"	III
235	2	100	"	V	"	VI
335	1	60	"	IV	"	IV
470	1	--	"	VI	"	V
480	2	110	"	V	"	V
550	2	90	"	II	"	III
585	1	590	"	VI	"	IV
656	1	50	"	II	"	V
659	2	30	"	VI	"	V
660	2	30	"	VI	"	IV
661	1	60	"	V	"	V
821	2	10	"	V	"	III
905	1	--	"	V	"	IV
923	2	30	"	II	"	II
924	2	270	"	II	"	II
939	2	40	"	III	"	V

Comparison of Foliage and Root Collar Injury
to Yellow Pine Attacked by *Dendroctonus brevicomis* in 1929

Classified by Injury to Foliage				Classified by Injury to Root Collar			
No.	Class of Trees	Vol. M.Ft.	Av.Vol. M.Ft.	No.	Class of Trees	Vol. M.Ft.	Av.Vol. M.Ft.
5	II	1050	210	2	II	300	150
3	III	120	40	3	III	150	60
2	IV	280	190	7	IV	1250	150
6	V	640	107	7	V	900	129
4	VI	650	162	1	VI	100	100
20		2740		20		2740	

A comparison of foliage and root collar injury shows that the largest number of trees attacked in 1929 by the western pine beetle occurred in Class V both in foliage and root collar injury.

In 1928 the largest number of trees selected for attack by the mountain pine beetle was in Class II, Foliage Injury, and Class VI, Root Collar Injury.

Status of Yellow Pine Trees Attacked by Dendroctonus brevicornis in 1929

Tree No.	Dia. In.	Grown Class	Condition	No. Rings Last 1/2"	Fire Injury Poliage	Fire Injury Root Collar
64	15.4	D	Leaning	12	IV	IV *
71	22.3	D	Forked top	8	V	IV *
106	24.4	D	Witch brooms	27	II	V *
160	9.6	Co.	Old fire scar at base	15	III	IV
207	17.1	D	Normal	7	III	III **
238	14.7	Co.	Leaning	14	V	VI
335	14.5	I	Witch brooms	12	IV	IV
470	11.8	D	Normal	6	VI	V *
480	17.3	I	Twin bole	11	V	V *
550	14.1	Co.	Leaning	17	II	III
585	24.4	Co.	Witch brooms	15	VI	IV
656	14.0	Co.	Twin bole	17	II	V
659	13.0	Co.	Forked top- witch brooms	12	VI	V
660	13.0	Co.	Normal	16	VI	IV ***
661	14.5	Co.	Twin bole	19	V	V
821	11.7	Co.	Leaning	9	V	III
905	6.5	D	Normal	5	V	IV
923	14.0	S	Suppressed	39	II	II *
924	19.8	I	Witch broom	33	II	II (a)
939	13.0	I	" "	25	III	V

* Pitched out attack, Dendroctonus monticola, 1928.

** Dendroctonus brevicornis attack following Idia oracana attack in top portion.

*** Attacked on one side by Dendroctonus brevicornis in 1928.

(a) Attacked on one side by Dendroctonus monticola, 1928.

A summary of this table shows that all of the yellow pine trees selected by the western pine beetle for attack in 1929 were in an injured condition. Many of them were weakened by other causes in addition to fire injury. The average number of rings in the last half-inch for the infested trees was 16.2. For 50 unattacked yellow pine of the same average diameter as the attacked trees and in Class II (Fire Injury to Poliage) the average number of rings for the last half-inch was 13.6.

Yellow Pine Attacked by *Ips oregoni*

Seventy-one yellow pine from 6 to 9 inches D.B.H. that were numbered and recorded in 1925 were attacked by *Ips oregoni* in 1929. These, with 56 smaller unnumbered trees, represent no loss in volume board feet, and in this case very little loss in yellow pine reproduction, as practically 95 per cent of these trees are beyond recovery owing to severe fire injury both to crown and root collar and were placed in Class VI in 1925.

Douglas Fir Attacked by Douglas Fir Beetle

Six fire-scorched Douglas fir, with a total volume of 2,000 board feet, were attacked by *Dendroctonus pseudotsugae*. These trees were damaged beyond recovery from the effects of the fire, and the attack by the Douglas fir beetle is considered only secondary in the loss of the trees.

Dendroctonus valens

Thirty-eight fire-scorched yellow pine were attacked at the base during 1929 by this species. In nine of these trees other barkbeetle attacks followed. No apparent damage resulted from the attack on the remaining 29 trees, 18 of which were from 6 to 9 inches D.B.H.

Woodborers

No loss in number of trees or volume board feet is accredited to woodborers during the season of 1929. Buprestid and Cerambycid larvae

were present in nearly all of the badly scorched trees under Class VI and trees attacked early in the season by *Ina arizonai*. The few trees that were burned through at the base and fell to the ground contained many woodboring larvae on the date of examination.

List of Species Seen on the Burn During the 1929 Examination

CERAMBYCIDAE

Ereutes spiculatus. Many dead adults were lying on the ground at the base of 1928 Bendroctonus monticolae attacked trees. A few active adults were seen in large bark furrows and deep fire scars of badly scorched trees.

Anoplaxia canadensis. One adult of this species was collected from fire-thrown yellow pine.

BUPRESTIDAE

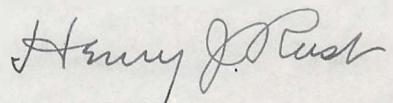
Chalcophora angulicollis. Several females of this species were seen ovipositing on fire-thrown logs.

Buprestis maculativentris var. rusticum. Both males and females of this species were seen on the badly scorched Douglas fir.

Buprestis alternans. Males and females of this species were seen on the fire-thrown yellow pine and badly scorched standing trees.

Buprestis aurulenta. One dead adult found on the ground near a group of fire-scorched trees.

Respectfully submitted

Henry J. Rust

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Senior Scientific Aid

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